NASA/GSFC	MISSION OPERATIONS & DATA SYSTEMS DIRECTORATE (MO&DSD) CONFIGURATION CHANGE REQUEST (CCR)

1. CCR NO. CCR-405-ICD-01	2. DATE February 28, 1997	3. PRIORITY ☐ EMERGENCY ☐ URGENT ■ ROUTINE	4. CHANGE LEVEL ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F

5. TITLE OF CHANGE

Documentation Update for WSC Baseline 96002

6.

DOCUMENT TITLE __ICD Between the NCC/FDF and the WSC for the TDRS H, I, J Era__

DOCUMENT NO. __405-TDRS-RP-ICD-001, 12/95__

LIST ALL AFFECTED DOCUMENTS INCLUDING PROCEDURES ____
530-NCC-FDF/WSC ICD

(CONT ON ATTACHMENT)

7. REASON FOR CHANGE

96002 WSC Baseline update for TDRS H,I, J Hughes evaluation.

(CONT ON ATTACHMENT)

8. DESCRIPTION OF CHANGE

The following 530-ICD-CCRs were incorporated into CCR-405-ICD-01 (previously CCR-ICD-1051):

CCR-1001-Workoff Item No. 2027 - TDM Flagging (12-6)

CCR-ICD-1038 - McMurdo Scheduling(9-11, AB-3)

CCR-ICD-1046 - Source of ODM Data (9-74)

CCR-ICD-02 (formerly CCR-ICD-1053) - IFL SHO Clarifications (2-12, 9-14)

(CONT ON ATTACHMENT)

9. IMPACT

YES NO		YES NO		YES NO		ORGANIZATIONAL							
						YES NO		YES NO		YES NO		YES NO	
☐ ■	SCHEDULE	☐ ■	RELIABILITY/MAINTAINABILITY/SAFETY	■ ☐	GROUND SEGMENT	☐ ■	501	■ ☐	530	☐ ■	MSFC	☐ ■	CODE E
☐ ■	BUDGET			☐ ■	SPACE SEGMENT	☐ ■	502	☐ ■	540	☐ ■	JSC	☐ ■	CODE S
☐ ■	FACILITIES	☐ ■	USER SERVICES/MANUALS	☐ ■	LOGISTICS	☐ ■	503	☐ ■	550	☐ ■	LERC	☐ ■	CODE T
☐ ■	TESTING	☐ ■	RISK MANAGEMENT	☐ ■	DOCUMENTATION	☐ ■	510	☐ ■	560	☐ ■	KSC	☐ ■	OTHER
☐ ■	TRAINING	☐ ■	SECURITY	☐ ■	HARDWARE	☐ ■	520	■ ☐	OTHER	☐ ■	JPL		
☐ ■	SPECIFICATIONS	☐ ■	USAF FUNDING REQ'D	☐ ■	SOFTWARE				Code 405				
☐ ■	CONTRACTOR SUPPORT	☐ ■	POWER	☐ ■	OTHER								
■ ☐	INTERFACES	☐ ■	WEIGHT										

10. COMMENTS

	SIGNATURE	DATE	CONCURRENCE:
STel ANALYST	_____	_____	
HARDWARE ENGINEER	_____	_____	
OPERATIONS REPRESENTATIVE	_____	_____	
SYSTEMS ENGINEER	_____	_____	
I AND T MANAGER	_____	_____	CODE 285
	_____	_____	
	_____	_____	DATE

11. BOARD ACTION
☐ APPROVED ☐ WITHDRAWN
☐ DISAPPROVED ☐ DEFERRED UNTIL _____

12. DIRECTION/ACTION REQUIRED
☐ ECP ☐ TECH DIRECTION ☐ CONTRACT MOD
☐ WAIVER ☐ PUBLISH DOCUMENT ☐ PUBLISH DCN
☐ DEVIATION ☐ C.O. LETTER ☐ OTHER _____

13. ORIGINATOR D. Littmann x7643 CODE __530.4__

SIGNATURE _____ DATE _____

14. SEGMENT MANAGER'S APPROVAL CODE _____

SIGNATURE _____ DATE _____

15. CCB APPROVAL

SIGNATURE _____ DATE _____

16. CCR IMPLEMENTED

ATR SIGNATURE _____ DATE _____
CCB SIGNATURE _____ DATE _____

WS-466 (3/87) REV. 2

12CCR/405-ICD-01

e. N5, Enable/Disable of best match strategy in the search mode (1 = enable, 0 = disable).

40. DIS Pre Service Test (PST) shall not be performed when any DIS Shuttle chain is already assigned. A DIS Shuttle chain is assigned from the earliest SHO service start time minus PST period to last service stop time.

41. The minimum value of the Max Data Rate parameter in a SHO shall be 1000 bps.

42. For users transmitting from a single source by QPSK modulation, only the I Channel data of Subheader 6 is applicable. For users transmitting BPSK, the applicable channel of Subheader 6 is as specified in Ground Rule 33.

43. MA services are applicable for TDRS A-G only. SSA and KSA services are applicable for TDRS A-J. SMA and KaSA services are applicable for TDRS H-J only. Incorrectly scheduled services for a TDRS shall be rejected.

44. Simultaneous scheduling of Ku and Ka Band services on the same SA antenna is not permitted.

45. Ka-Band services are DG-2, noncoherent only. There are no tracking services at Ka-Band.

46. IFL SHOs shall be applicable for Cacique only and shall not be reconfigurable. The number of services in an IFL SHO is always 1. Each service in a normal or EET SHO that specifies use of the Danzante HDRM will result in an IFL SHO being scheduled at Cacique. The number of data channels which may be accounted for in the IFL SHO's Subheader 6 is always 2. For Shuttle KSAR, channel 1 is always omitted.

2.2.3 End-To-End Test (EET) Data Ground Rules

The following ground rules apply to End-to-End Test SHO's:

1. Deleted.

2. End-to-End Test services cannot be scheduled alone, i.e., the related traffic services must be included in the SHO.

3. In an End-to-End Test SHO, the start time specified in an End-to-End Test data set must be the same as that of the related traffic service and the stop time in the End-to-End Test data set must be the same as that of the related traffic service.

4. End-to-End Test services cannot be included in a normal SHO. An End-to-End Test SHO must be used for End-to-End Test services.

5. All End-to-End Test SHO reject messages shall be sent to the NCC without operator intervention.

6. Shuttle End-to-End Test and pre-service test shall not overlap on the same SA antenna on any TDRS, e.g., if Shuttle End-to-End Test services are on-going on SGLT1 SA-1, then in order to avoid conflict, schedule overlapping Shuttle pre-service tests on SA-2 of SGLT1, 2 or 3, i.e., not on SA-1 of SGLT2 or 3. Shuttle SHO's shall not be rejected

# of Bytes	Data Item

2   Hours

2   Minutes

2   Seconds

1   Data Destination

         1 = LI

         2 = HDRM

         3 = MDM

         4 = Record Only

         5 = Television (TV) - Shuttle Only

         6 = Analog Data - Shuttle Only

1   LI

         <u>0 = Local MTRS Recorder Interface</u>

         1-4 Channel I.D.
         100 BPS $\leq$ Data Rate $\leq$ 10 MBPS

         5-8 Channel I.D.
         10 MBPS < Data Rate $\leq$ 300 MBPS

         ~~0 = not LI~~
         If Data rate is $\geq$ 150 MBPS, 5-8 specifies
         the service, i.e., no Q-Channel specified.
         <u>A zero (0) shall be specified if the data destination
         is not LI.</u>

1   HDRM

         0 = Not used

         1-4 Input Port Number

         If non-zero and SHO Class = 6, this is the HDRM
         input port for data which is received on the same
         High Data Rate Demultiplexer (HDRD) port.
         When SHO Class = 6 the SHO will contain only the
         SHO Header and Subheader 6. The same HDRM
         input ports at STGT and WSGTU shall not be
         simultaneously scheduled. A SHO Class 6 shall be
         sent to WSGTU whenever the HDRM at STGT is
         scheduled.

2   Port Address*

         4 Hexadecimal Characters

** For Shuttle K-Band Mode 2 Channel 3 this field is either:
   a. Data rate for digital data from 16 Kbps to 4 Mbps,
   b. Data rate for 1.024 Mhz subcarrier; 1,2,4,8 or 16 Kbps, or
   c. Not applicable if Data Destination is 5 or 6.
   For Shuttle K-Band Channel 2 this field is either:
   a. Data rate for digital data from 16 Kbps to 2 Mbps, or
   b. Data rate for 1.024 Mhz subcarrier: 1,2,4,8 or 16 Kbps.

For normal and EET SHOs (SHO Classes 1 and 3) aA valid data rate is required to configure a DIS data patch for Data Destinations 1, 2, 3, and 4. A zero data rate for these Data Destinations shall indicate that a DIS data path shall not be initially configured for this channel, but that the channel may be established via reconfigurationed. Data rates less than 125 kbps for Data Destination 2 shall be rejected. For Data Destinations 5 and 6, a zero data rate may be specified to indicate a DIS path shall be configured for the channel.the data rate shall be ASCIIspaces and tThese destinations shall be reconfigurable.

9.5   Message Subfield for ODM's

The message subfield of the 4800-bit data block (bytes 23 through 596) shall be used to send operation data messages (ODM's). These messages shall be sent from STGT to the NCC once every five seconds. The staleness of the data provided at the DIS interface shall not exceed five seconds relative to the time that the data were acquired. The time tag in the ODM's shall be the time at which the data in the ODM were acquired. ODM's shall be sent from STGT to the NCC only for ongoing services.

An ODM consists of a header followed by a combination of subheaders and structured data items, to indicate each specific service and provide the related data.

For TDRS H, I, and J S-Band MA return service (SMAR) ODM's shall be provided within SA ODM formats while S-Band MA forward service (SMAF) ODMs shall be provided within MA ODM formats.

Separate SA/SMAR, MA/SMAF, and End-to-End Test ODM's are used to report on the active services for each TDRS.   Therefore, if three TDRS's are providing both SA/SMAR and MA/SMAF services, six ODM's are required to report these operations data.

Angles 1, 2, and 3 in the following ODM headers provide the orientation of the corrected local TDRS coordinate system relative to the NASA-defined coordinate system. The corrected local TDRS coordinate system is the spacecraft body coordinate system with the origin at the spacecraft center-of-mass, the Z-axis along the spacecraft longitudinal centerline, the Y-axis parallel to the solar array rotational axis and pointed toward the SGL antenna side of the spacecraft, and the X-axis completing the right-handed set.   The NASA-defined coordinate system is the spacecraft attitude reference coordinate system with the origin at the spacecraft center of mass, the Z-axis in the orbit plane pointed toward nadir, the X-axis in the orbit plane pointed in the direction of spacecraft orbital motion, and the Y-axis completing the right-handed set. These angles transform the attitude reference coordinates to body coordinates, given by the following order of rotations: Angle 1 (yaw), a rotation about the Z-reference-axis; angle 2 (roll), a rotation about the resultant X-axis; and angle 3 (pitch), a rotation about the resultant Y-axis. The orientation of the corrected local TDRS coordinate system (body coordinates) relative to the NASA-defined coordinate system (attitude reference coordinates) will be provided to an accuracy of 0.1° in pitch and roll and 0.25° in Yaw.

RF beam pointing data in the ODM's provide the orientation of the RF beam relative to the TDRS orientation. The angles to be reported shall be derived from the TDRS to user vector from which MA beamforming data was derived. The RF beam pointing parameters will be given as rotation angles from the spacecraft body coordinate system in the following order: Azimuth, a rotation about the Y-body-axis; and Elevation, a rotation about the resultant X-axis. The RF beam pointing shall be provided to an accuracy of 0.5° for SA and 2.0° for MA.

The DIS provides only Shuttle forward DQM ODM data. For TDRS F1-F7, TDRS orientation and RF beam pointing are provided by TTC for all applicable ODMs except for MA return service (provided by USS). All other data is provided by USS.

return link supporting the tracking service, an indication if STGT is providing tracking service to the NASA ground-based TDRS tracking data transponders that are identified in byte 56, and the configuration of the tracking service.

The contents of this field shall be as defined below:

Field Location	Contents
Bits 4-8	MA return link ID; binary ID of the MAR equipment string (including receiver), providing the tracking service. Binary zero shall indicate MA return link not supporting. The LSB is Bit 4.
Bit 3	TDRS tracking data only indication. Bit 3 is zero when: 1309 < User SIC < 1373; otherwise: Bit 3 is one.
Bits 1-2	Tracking service configuration

Bit 2	Bit 1	
0	1	Return link only (no forward link established to user)
1	0	Forward and return link established by this TDRS
1	1	Spare
0	0	Spare

r. Data Validity. The contents of this field (byte 51) shall indicate the validity of the contents of the range field (bytes 27-32), the Doppler count field (bytes 33-38), and the return link antenna angle fields (bytes 19-26).

Two-way Doppler data is valid if:

1. Associated receiver has indicated carrier track at each sample point (once/second) throughout last tracking sample period.

2. Forward Doppler is per the following three cases:

    Case 1: Forward Doppler compensation has been inhibited; i.e., the slow and hold function has been completed and the forward frequency is fixed.
    Case 2: Same as Case 1, except for DG-1. Doppler compensation is not a factor for validity in the DG-1 mode.
    Case 3: Doppler compensation is not a factor for validity in any mode.
    Cases are set by TOCC operator for individual users.

3. The associated IR is not exhibiting a fault indication.

LSD	Logistics Support Depot
LSD	Least Significant Digit
MA	Multiple Access
MAF	Multiple Access Forward
MAR	Multiple Access Return
Mbps	Megabits Per Second
MCC	Message Class Codes
MDM	Multiplexer/Demultiplexer
MHz	Mega Hertz
MO&DSD	Mission Operations and Data Systems Directorate
MS	Mission Support
MSB	Most Significant Bit
MSD	Most Significant Digit
MSM	Maintenance and Software Delivery Mode
<u>MTRS</u>	<u>McMurdo TDRSS Relay System</u>
MUX	Multiplexer
NASA	National Aeronautics and Space Administration
NASCOM	NASA Communications Network
NCC	Network Control Center
NCCDS	Network Control Center Data System
ND	Networks Division
NGT	NASA Ground Terminal
NRZ	Non-Return to Zero
NRZ-L	Non-Return to Zero-Level
NRZ-M	Non-Return to Zero-Mark
NRZ-S	Non-Return to Zero-Space
ODM	Operations Data Messages
OPM	Operations Messages
PDA	Pin Diode Attenuator
PM	Preventative Maintenance